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Application of Control Volume Analysis to Cerebrospinal Fluid Dynamics TIMOTHY WEI, University of Nebraska, BENJAMIN COHEN, RPI, TOMER ANOR, JOSEPH MADSEN, Harvard Medical School — Hydrocephalus is among the most common birth defects and may not be prevented nor cured. Afflicted individuals face serious issues, which at present are too complicated and not well enough understood to treat via systematic therapies. This talk outlines the framework and application of a control volume methodology to clinical Phase Contrast MRI data. Specifically, integral control volume analysis utilizes a fundamental, fluid dynamics methodology to quantify intracranial dynamics within a precise, direct, and physically meaningful framework. A chronically shunted, hydrocephalic patient in need of a revision procedure was used as an in vivo case study. Magnetic resonance velocity measurements within the patient's aqueduct were obtained in four biomedical state and were analyzed using the methods presented in this dissertation. Pressure force estimates were obtained, showing distinct differences in amplitude, phase, and waveform shape for different intracranial states within the same individual. Thoughts on the physiological and diagnostic research and development implications/opportunities will be presented.

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